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Preservice Teachers Perception about Nature of Science

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Abstract: Teacher student is an important role improving their own perception what science should be anticipated in classroom. Also, science learning in the current studies try to have relied understanding in the nature of science. This research aimed to study teacher student's perception in the nature of science. One hundred and one of junior teacher students were studied by interviewing and questionnaire. Data were collected, categorized and analyzed in terms of students perceived about nature of science. Results can be presented in three manifests. First, teacher students perceived their own nature of science in term of knowledge construction. It can be raised into five criteria: science as a subject that studied natural phenomena, science as a body of knowledge, science as inquiry process, science as a thinking process and science as a description of moral and ethics. Second, teacher students perceived their nature of science in term of process of knowledge construction. They expressed their opinions that no observation and experiment, no science. Finally, teacher students perceived their nature of science in terms of scientific enterprise. They expressed their opinions by means of relationship between Science, Technology and Society (STS). Science is a part of society, its role is important for social development and self-actualization. Some of them referred to science in negative point of view.

Key words: Nature of science, preservice teacher, perception, opinions, needs, Thailand

INTRODUCTION

Nature of science has been a common theme in science education efforts as an essential aspect of scientific literacy American Association for the Advancement of Science (AAAS, 1993). The efforts to improve students understanding about nature of science focused on pre and in service teachers with an adequate understanding about nature of science (Akerson *et al*., 2000; Chin, 2005; Irez, 2006; Southerland *et al*., 2006; Charney *et al*., 2007; Chen, 2007; Khishfe and Lederman, 2007; Lui and Lederman, 2007). Teachers understandings about nature of science appear to be essential, but not sufficient for translating into science teaching such as pressure to cover content (Duschl and Wright, 1989), perception about nature of science less significant than cognitive outcomes (Abd-El-Khalick *et al*., 1998) and instructional intention to teach nature of science (Lederman, 1999). Moreover, confusion between nature of science and science processes with lacking of knowledge related to pedagogical approaches (Abd-El-Khalick *et al*., 1998) and lacking of subject matter knowledge (Schwartz and Lederman, 2002).

Facilitate factor to gain more understandings the nature of science is knowledge of nature of science pedagogical approaches. Teacher may have an adequate understanding of nature of science, knowledge of how to teach nature of science is necessarily required for the translation of this knowledge into classroom practice (Akerson and Abd-El-Khalick, 2003; Schwartz and Lederman, 2002). However, pedagogical knowledge of how to explicitly and reflectively address nature of science in classroom practice has not been the main focus of much research. Indeed, the majority of research on helping teachers pedagogical knowledge has been conducted in the context of preservice education and not with inservice teachers. Preservice science teachers should be awaked on lesson planning and teaching behavior in classroom (Abd-El-Khalick *et al*., 1998). Science content and nature of science should be incorporated (Lederman, 1999).

Science teacher preparation programs are windows opportunity for future inservice teachers, who can develop pedagogical strategies, allows science literacy into classroom, potentially gain positive attitudes towards science for tomorrow students and also, serves science for society in every level. For these reasons, preservice science teachers should be incorporating nature of science that will be beneficial to science teachers preparation in these aspects.

The present study focused on how preservice science teachers perceived their understandings about

nature of science. The results will be useful and improved preservice teachers to develop pedagogical knowledge for teaching about nature of science through a professional development program.

MATERIALS AND METHODS

Sample: Research report and studies about nature of science were reviewed. Lederman (1992) desired to researcher how teacher students perceived their nature of science. The purposive sample of this study consisted of 101 junior general science teacher candidates. The participants were enrolled in a 506335 curriculum and instruction in science one course, Mahasarakham University, first semester, academic year 2007. They were in their 3rd year of a 5 years teacher education program; 22 of them were male and 79 were female. Their ages were between 19 and 21 years. All participants had taken the previous licensure courses required by the teacher education, social science and science programs.

Procedural study: Peer teaching of what teachers plan to do with their students were conducted. They were asked to present their lessons. It provided student teachers with opportunities to plan lessons, implement lesson plans and to observe their peers presentations in the context of various science content and teaching approaches. Peer teaching cannot reflect a real classroom situation. There was always the possibility that teachers cannot implement the same teaching demonstrated as in their real classroom setting. This fact is a limitation of the present study and should prudently be considered in interpreting the findings.

The researchers independently read lesson plan, observe each of teaching lessons and summarized them. Then, they observes peers' classroom implementation, how to address aspects of nature of science. Also, during the study, the researcher interviewed and listed their response in terms of questionnaire about nature of science. The researcher's role was the participant observer. Along with the notes from informal conversations, field notes were used to record the types of classroom activities, student participation and the interactions between the instructor and the students. After every class period, field notes were reread and summarized into a one page summary. The observation data was compared with the quantitative findings to explain the pretest and posttest survey results.

RESULTS

Perceived on scientific knowledge: Teacher students raised their own perception about nature of science in differently, five criteria can be concluded in terms of scientific knowledge: subject matter, which try to explain natural world and physical world that surroundings us, body of knowledge, process of inquiry learning, thinking process and thing for explaining moral and ethics.

> Science as a body of knowledge, thinking process and inquiry method. It has systematic to study, data collection and support fact by employing scientific method (Knitta)

> Science is a term of phenomenal studies leading us to understand how natural world works (Oranuch)

> Science emerged by scientific method that meant science works in terms of universal knowledge, it can be accepted for society by societal rules and it tend to be change (Tawinant)

Someone couldn't be decided that science concerns social aspect, scientists were key element to produce and to distribute into human society. Scientific knowledge can be changed if evidences can be more reliable. Also, science accept only data or method leading us to the truth, it also tend to be change. Scientific knowledge can affect personal prior knowledge, self-concept and belief on science. They regard to impact of scientific knowledge on their beliefs about science teaching.

Perceived on scientific inquiry: When, the characteristics of science were listed, most of teacher students give distinctive issues. Inquiry method is an important role to make science differs from others, but some of them believed that science is not differ from others, i.e., philosophy, religious, sociology and so on.

> Science teach us walking into the truth, religious and philosophy are also lead us to be real by teaching and practicing (Duangduen)

> Science, religious, philosophy and sociology are not distinctly. It allows us to inquire knowledge through proving and doing widely distributed knowledge in the world (Rattikarn)

> Because of something in the world so big and far away, experimental science is complex and technology hard to reach (Ekkasith)

> Science need experimentation and it can make things in the world look differently (Lamai)

However, respondents perceived that science make differently from others. No experimentation, no science is a major consideration that they claimed. Experimentation

is remarks of science to produce body of knowledge, some beliefs, some cultures and unproved need experimental science manifest and describe as well.

Perceived on scientific enterprise: The paradigm of science to be a part of society, in general, science, technology and society are related. On behalf of science plays its role to be important and necessarily improving knowledge-based society. Preservice teachers need to understand science in both globally and locally contexts.

> Science is universal, affect to societal and cultural contexts in each region in terms of societal effects when science emerged and developed, we have too much facilities to support (Prajak)

> Science is culture for new modern society, all should be known and developed understandings about science and its natural world (Theerapong)

> Scientific knowledge is universal and relevant to culture in each region an also it can be explained by means of science (Tawinant)

> Although, science is universal, all should be known about some limitations and link it to societal and cultural aspects, but science can affect society, religion, philosophy and norms in each region (Kannika)

Some students focus their own ideas in terms of the fruitfulness of science by means of negative for society, local culture and traditional way of life. Science and technology make it role to be substituted, patterning for survival in way of life declined and pseudo society emerged.

> Science invented new technology that made modern society be more comfortable such as old era human being no need tools for hunting, then human being build eating culture, then they known how to develop tools and facilities (Nipaporn)

> Human cloning is useful for replicated, but in general, science considered good, culture reject because replication make wrong in sense of Buddhists (Maneethong)

These events are often stimulated by preservice science teachers saying and doing things regarding the nature of scientific enterprise, but they may also arise through the action of the teacher activities in societies. Classroom experience stimulates and encourage them to discuss and reflect and through this reflection. These experiences and perception could be stimulators and then they can be translated into more academic discourse.

DISCUSSION

Student teachers perceived sense of science in different views based on prior knowledge and understanding. Most of them described science as a subject matter, body of knowledge, inquiry process, thinking process and knowledge about moral and ethics. The American Association for the Advancement of Science (AAAS) (1990) concluded that science is an systematic explanation on natural and physical world, try to understand phenomena are scientific knowledge emerged by observation first and then leading to theoretical development. Scientific knowledge are universal, decided to be right and prove in terms of cause and effect, rational decision, making decision based on foundations of logics (Mohr, 1977).

Science is a body of knowledge, systematic thinking, inquiry process, scientific method and production science (Sund and Trowbridge, 1967; Collette, 1973; Snyder, 1978; Coulter *et al*., 1981) evidence-based observation (Trojack, 1979) prove by facts (Lederman *et al*., 2001) try to explain natural phenomena and employed observation to be prior (McComas, 2000) and scientific concepts affect to human society for creation and uses (Schwartz and Lederman, 2002). Most of students perceived nature of science in various feelings and ideas. They express science in terms of inquiry process, observation-based phenomenon, always experimentation and empirical data (Andersen, 1969). However, some of them had a controversy by means of science with no need experimentation, but it need prior experiences that it can be made misconception about nature of science.

If student teachers have misconception about nature of science, they will not teach and make a connection nature of science into classroom practice. Attitude towards science cannot reach educational goals, scientific process skills not allows to their pupils. It can be referred to professional development program, which need more focusing on teaching strategies, pedagogical approach and philosophy of science. It also makes, a relation to Science, Technology and Society (STS) that bring science to serve paradigm of science for all (Collet and Chiapetta, 1994).

In addition, some of them reflect their own ideas science in negative views. Society, local culture and way of life will be ruined by the production of science. Ethics in science uses should be looked and decided (Lederman, 1999; Backhus and Thompson, 2006). Abd-El-Khalick *et al*. (1998) showed that preservice teachers possessed adequate understandings of nature of science, but few explicitly addressed nature of science in their teaching. Many student teachers claimed that they taught nature of science, pedagogical approach to

teaching nature of science was simply to involve students in doing science without any attempt to discuss about it. Moreover, Bell *et al.* (2000) reported that teachers were better than those in the prior research with respect to the teaching of nature of science in an explicit and reflective manner.

The existing study implies that science educators should specifically help teachers learn how to teach nature of science. The efforts include helping teachers shift their pedagogical approaches of teaching nature of science, learn how to assess their students understandings of it and improve their abilities to incorporate nature of science into science content lessons. Science courses should promoted teacher preparation programs about nature of science; the course should have a positive impact on participants beliefs about personal science teaching. Also, science should expressed their pedagogical knowledge to teach nature of science (Bursal, 2008).

CONCLUSION

The findings pointed that some preservice teacher students have is conception about nature of science, especially scientific inquiry and science process. Teacher production institute and related should aware and plan to fulfill their understandings about nature of science such as pedagogical approaches, integration between content and nature of science in school science, professional development program for pre and inservice science teachers. Irez and Cakir (2006) pointed that science teachers did not possess adequate conceptions about scientific enterprise. Science teachers views were generally compartmentalized and lacked consistency; they were often not provided with opportunities to reflect on and clarify their views about the nature of science. Program for science teacher preparation should stimulate critical reflective thinking among prospective science teachers about their personal theories on the nature of science.

Science teaching should incorporate nature of science into classroom, practice in science teaching for micro teaching classroom, program for scientific attitudes development, classroom panel discussion, project-based science learning. Further research, need more effective and attention to perceived nature of science in terms of inservice science teachers, to reflect ways of developmental plan. It also needs policy decision for development nature of science.

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